Demonstration of an Multidisciplinary Design Analysis and Optimization (MDAO) Process for Vertical Lift Vehicles

Completed Technology Project (2015 - 2019)

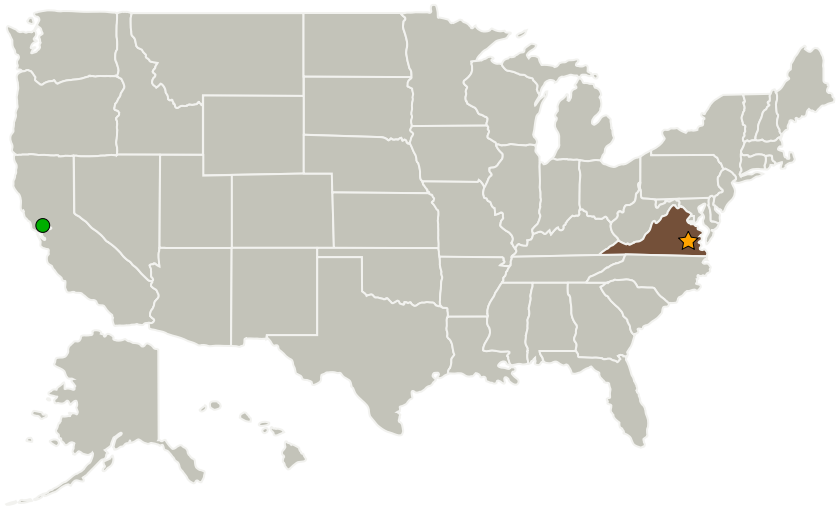
Project Introduction

Demonstration of an Multidisciplinary Design Analysis and Optimization (MDAO) Process for Vertical Lift Vehicles challenge is to overcome the current practice of a serial design approach using single-discipline optimization, NASA will develop and demonstrate a streamlined, integrated, multi-disciplinary optimization process of consistent fidelity for conceptual design of Vertical Takeoff and Landing (VTOL) aircraft.

Anticipated Benefits

Enables the ability to use formal optimization tools to assess configuration trades for multiple requirements. Will provide cleaner , quieter VTOL configurations that serve as drivers for focusing and advancing technologies.

Primary U.S. Work Locations and Key Partners



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Organizations Performing Work	Role	Type	Location
Langley Research Center(LaRC)	Lead Organization	NASA Center	Hampton, Virginia
Ames Research Center(ARC)	Supporting Organization	NASA Center	Moffett Field, California
Army	Supporting Organization	US Government	Washington, District of Columbia

Primary U.S. Work Locations
Virginia

Project Transitions

October 2015: Project Start

September 2019: Closed out

Closeout Summary: In closing out the MDAO process, an assessment of the en vironmental impact of a vehicle can now be made in a much more integrated ap proach.
The final tool chain demonstration goal supporting this Technical Challenge was to design a VTOL aircraft with at least 50% lower emission and 70-80% lower n oise than the corresponding baseline vehicle. In 2016, the plan was to develop a n acoustic module appropriate for conceptual design vehicle optimization – the module or surrogate was not developed by the completion of this Technical Chall enge. Rather, acoustic optimization was completed using a high-fidelity analysis instead of a surrogate model. The analysis predicts that the low-emission, low-noise Side By Side vehicle design would produce 60% less emission and is 9.6 d B (67%) quieter than the baseline vehicle

Project Website:

https://www.nasa.gov/aeroresearch/programs/aavp/rvlt

Organizational Responsibility

Responsible Mission Directorate:

Aeronautics Research Mission Directorate (ARMD)

Lead Center / Facility:

Langley Research Center (LaRC)

Responsible Program:

Advanced Air Vehicles

Project Management

Program Director:

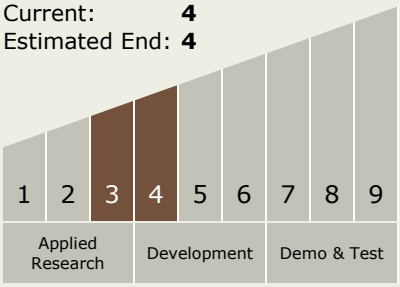
James A Kenyon

Project Manager:

Susan A Gorton

Technology Maturity (TRL)

Start: **3**
Current: **4**
Estimated End: **4**



Technology Areas

Primary:

Continued on following page.

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Technology Areas *(cont.)*

- TX11 Software, Modeling, Simulation, and Information Processing
  - TX11.5 Mission Architecture, Systems Analysis and Concept Development
    - TX11.5.3 Tools and Methodologies for Vehicle or Concept Definition Activities

Other/Cross-cutting:

- TX11 Software, Modeling, Simulation, and Information Processing
  - TX11.2 Modeling
    - TX11.2.2 Integrated Hardware and Software Modeling

Target Destination

Earth